# VT-2000

## Secondary Surveillance Radar Transponder Mode-S

# User manual

Add this manual to the flight instruction manual of your aircraft

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## Record of Revisions

Always keep this page in front of this document.

| Date | Revision | Pages | Changes | by |
|---|---|---|---|---|
| 01.03.2007 | 1.0 | all | initial release | JG |
| 11.02.2008 | 1.1 | all | added: Features of UI FW-Rel. 1.20 | JG |
| 11.04.2012 | 1.2 | Alle | added: Instructions for VT-2000<br>removed: Instructions for VT-02 | JG |
| 25.04.2012 | 1.2a | Alle | added: Information about current drawn when switched OFF | JG |
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## Applicability

This manual applies to Mode-S transponder P/N VT-0201

from Hardware MOD Index: 4
Software MOD Index: 4

in this manual named ***VT-2000*** (trade name).

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## Preface

This manual contains operating instructions for the Mode-S transponder VT-2000. It should be read before operating your VT-2000 transponder. Please contact your supplier in any case of doubt or for additional questions.

### Safety symbols:

The following symbols and terms are used in this manual:

| | |
|---|---|
| | ***Warning***<br>***Warning statements identify conditions or practices that could result in injury or loss of life.*** |
| | ***Caution***<br>***Caution statements identify conditions or practices that could result in damage of this product or other property.*** |
| | ***Important note:***<br>***Indicates important or usefull information. It is strongly recommended to read, understand and follow the statement.*** |

***The pilot is always responsible to respect all legal aspects and obligations resulting in operating this installed VT-2000.***

***To prevent damage caused by overvoltage or voltage spikes, always switch off the system when starting or stopping the aircraft's engine. Damage caused by spikes or overvoltage can be determined by the manufacturer and are not covered bythe manufacturer's warranty.***

# 1. Switching ON and OFF

| | |
|---|---|
| | Switch ON the VT-2000 by pressing one of the keys **SBY**, **GND**, **ON**, **ALT**. The unit starts in the selected mode.<br><br>Press key **OFF** and hold until the units switches off. |
| | Startup screen after switching on the device.<br><br>The screen informs about the firmware version installed in the **control unit**.<br><br>**NOTE:**<br>Firmware and FPGA version information can be found in Main Menu.Setting.Info of the device. |

After switching on the avionic main switch of your aircraft, the device restarts in the same as operated when the avionic main switch has been switched off.

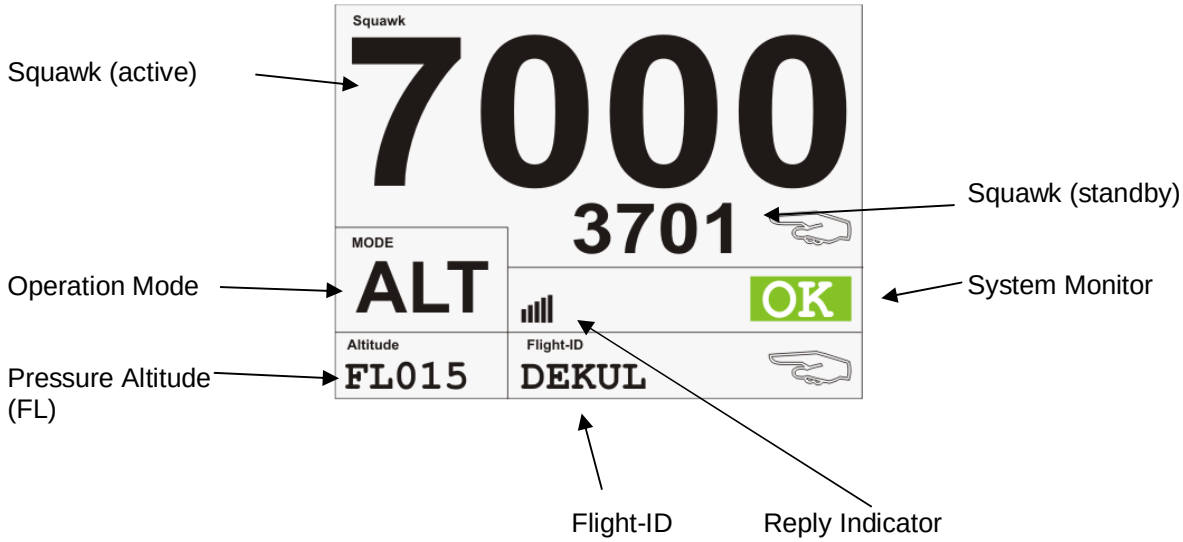
*Example:*
*Avionic main switch has been switched off when transponder was running in ALT mode. If switiching on the avionic main switch again, the device starts in ALT mode.*

If switched off, the VT-2000 draws a current of about 2 mA @ 12V.

To prevent deep discharge of you aircraft battery, please switch off the avionic main switch if not operating the aircraft.

## 2. Normal Operation

When in normal operation mode, the following screen is shown by the system:

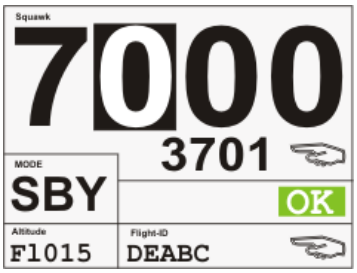



If no Mode-S Adress has been entered, the Flight-ID is replaced by a blinking text **No Mode-S.** The system operates in Mode-A/C then.

The pressure altitude refers to 1013,25 hPa and is displayed in flightlevels (FL).

## 2.1. Entering a Squawk (Reply Code)

Use the keypad for entering the desired squawk



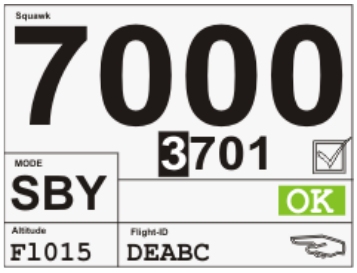

- After pressing the first numeric key, the selected entered value will be indicated in the first position of the squawk string. The cursor jumps to the next position automatically.
- Undesired inputs can be changed by pressing **CLR**. The Cursor jumps one digit to the left and the wrong input can be overwritten by entering the correct value.
- After inputting the last digit, the squawk is complete and will be activated immediatly. So be carefull not to enter and undesired squawk.
- Pressing **VFR** invokes the presetted VFR squawk The previous entered squawk will be moved into the standby squawk
- Pressing toggles between active and standby squawk.

If not desired, do not enter one of the following emergency squawks:

**7500**: indicating unlawfull interference (hijacking)
**7600**: indicating loss of communications
**7700**: indicating general emergency

Entering this codes may cause search and rescue operation or interception by national airforces.

## 2.2. Entering a Standby Squawk

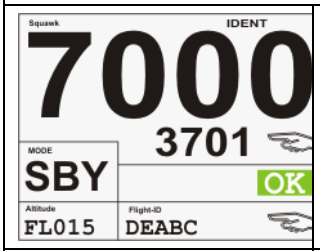



Enter the standby squawk using the VT-2000 keypad.

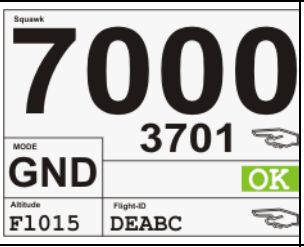
- Activate the edit mode by pressing the upper softkey. The symbol ☜ near the standby squawk changes to ☑.
- Enter the desired standby squawk using the keypad now.
- Undesired inputs can be changed by pressing **CLR**. The cursor jumps one digit to the left (=backspace) and the wrong input can be overwritten by entering the correct value.
- After inputting the last digit, the squawk has been completed and will be activated immediatly.
- Pressing toggles between active and standby squawk.

## 2.3. Selecting a Mode

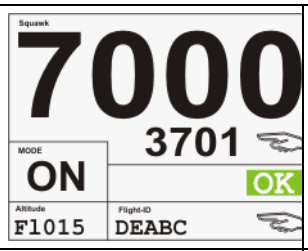
Select the desired mode by pressing one of the keys **SBY**, **GND**, **ON**, **ALT**.



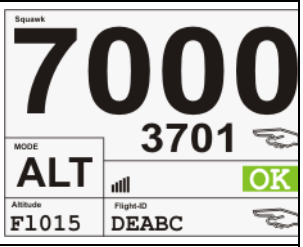

Standby Modus




On-Ground Modus




ON-Modus




ALT-Modus

| Display | Mode | Description |
|---|---|---|
| SBY | Standby | Standby - System is switched on, no replies or squitters will be sent. |
| GND | On-Ground | Mode-A/C/S intermode All-Calls will not be replied |
| ON | System operating, no alticode will be replied | Selected reply code will be replied for Mode-A/C interrogations, no altitude information is transmitted, squittering is enabled, Mode-S interrogations will be replied. Switch to this mode only if required by ATC . |
| ALT | System operating, alticode will be replied | Selected reply code will be replied for Mode-A/C interrogations, altitude information is transmitted (=indicated value), squittering is enabled, Mode-S interrogations will be replied (standard operation mode) |

If the airframe provides an Weight-on-Wheels (on-Ground) switch and the transponder has been configured properly, manual switching to ON or ALT mode is not possible while aircraft is on ground. If switching the on-Ground switch to airborne, the unit sets the ALT mode automatically, if not set to SBY mode before.

## 2.4. IDENT Function

Pressing **IDT** invokes the ident mode for 18 sec and indicates a message in the LCD.

***Press the ident key only if requested by ATC!***

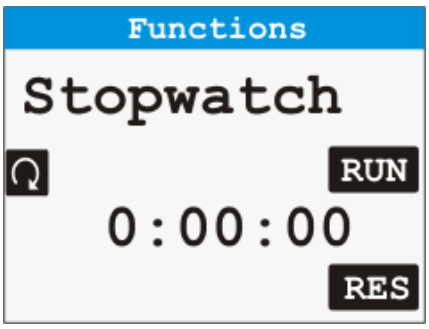
## 2.5. Additional Functions

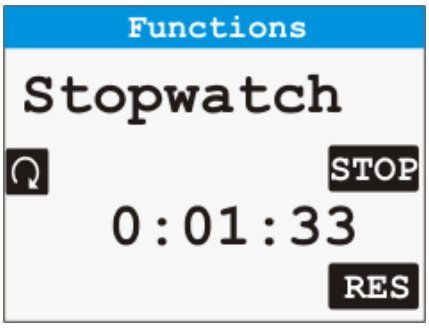
The VT-2000 provides some usefull features such as stop watch, countdown and altitude monitor.

Press **PGE** to enter the first page of this additional functions.

Press to switch between the different function pages (softkey ↻ ).

### 2.5.1. Stop Watch




| | |
|---|---|
| **RUN** | starts the stop watch |
| **STOP** | stops the stop watch |
| **RES** | resets the running or stopped watch to 0:00:00. |

### 2.5.2. Altitude Monitor

**REF** sets the current pressure altitude for reference and activates the altitude monitor

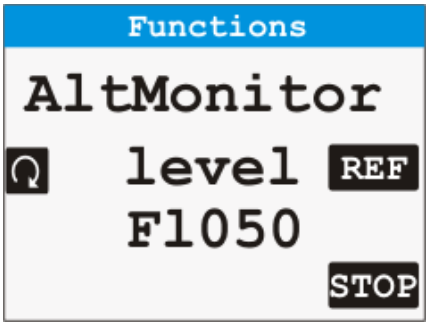
Deviations from the presetted reference are indicated optical and audible

**STOP** stops the altitude monitor

**GO** resumes the altitude monitor function with the stored reference

0 decreases reference altitude by 100ft.

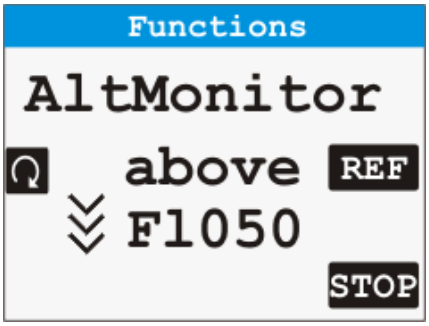
2 increases reference altitude by 100ft.




*Example:*

Altitude monitor active. Current reference: FL 050

No deviation (=**level**)

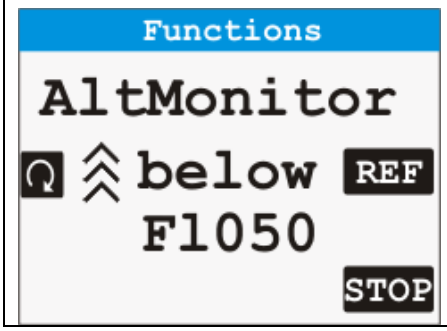



Alt monitor active. Current reference: FL 050

Deviation: 300 ft above reference (=**above**)

One ^ indicates a 100ft deviation.

The chevron's direction commands: Descend




Alt monitor active. Current reference: FL 050

Deviation: 300 ft below reference (=**below**)

The chevron's direction commands: Climb

### 2.5.3. Count Down

Setting the countdown initial value:

2 increases the initial value by 30 sec.

0 decreases the initial value by 30 sec.

Press and hold the keys to increase the step size to make inputs more comfortable

**RUN** starts the count down

**STOP** stops the count down

## 2.6. More Settings

Pressing **PGE** twice in the normal operation enters the main menu. Some unprotected setting can be made up to the pilot's preferences.

### 2.6.1. Rudiments of Operation:

#### 2.6.1.1. Menue Navigation

| | |
|---|---|
| | Navigate through the menues using the VT-2000 keyad.<br><br>2 moves the cursor up<br><br>0 moves the cursor down<br><br>**SEL** selects the inverted menu item<br><br>**EXIT** leaves a submenu |

### 2.6.1.2. Value Input

Handle input fields as follows:

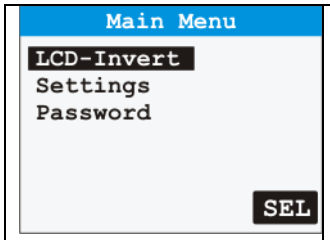
- Select a field using 2 or 0 .
- **SEL** activates the edit mode for the selected field. Editable fields are displayed in inverted style.
- If the first digit of a string is inverted, use the 4 or 6 to navigate to the desired postion.
- Change values in the string using 2 or 0 .
- If the entire string is displayed inverted, no single digits can be changed. Use 2 or 0 to select from presetted values.

**ESC** quits the edit mode without saving changes

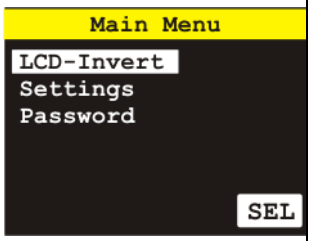
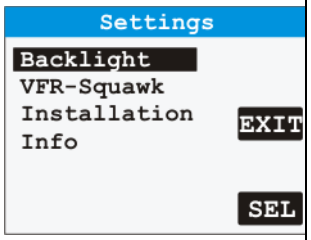
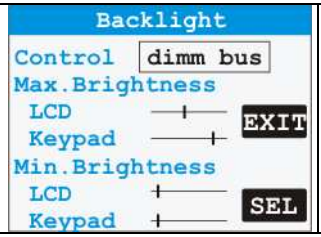
**SAVE** saves the value entered in the field and quits the edit mode.

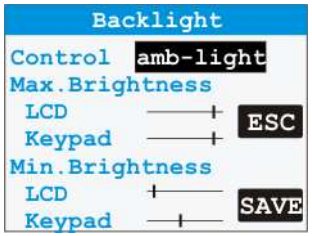
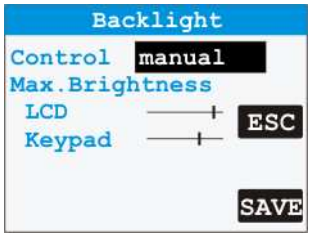
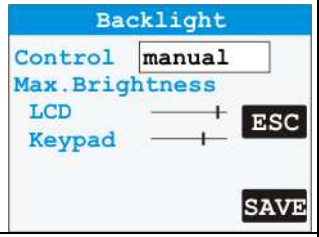
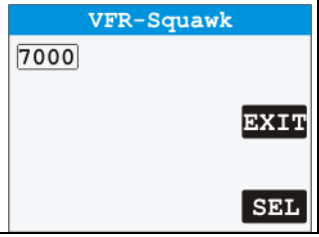
**EXIT** leaves a sub menu

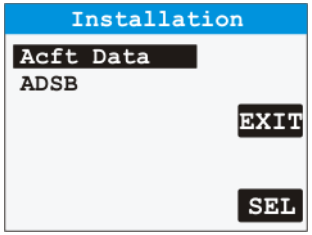
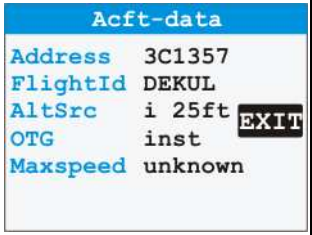
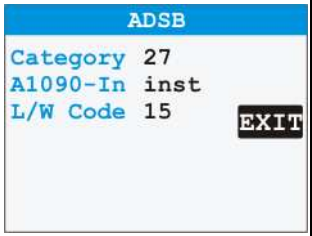
### 2.6.1.3. VT-2000 Menu Tree

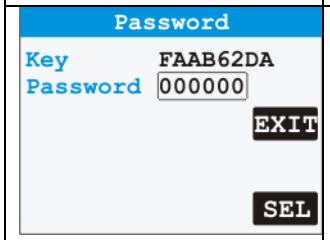
<table>
<tr><td> 
</td><td colspan="3">

- LCD-Invert: switches manually between day mode and night mode
- Settings: invokes submenu settings
- Password: invokes password page for extended setup

</td></tr>
<tr><td> 
</td><td colspan="3">LCD night mode</td></tr>
<tr><td></td><td> 
</td><td colspan="2">Submenu Settings:<br><br>• Backlight (Control of LCD and keypad backlights)<br>• VFR-Squawk (Presettings for VFR key)<br>• Installation<br>• Info (shows info screen / firmware version information)</td></tr>
<tr><td></td><td></td><td> 
</td><td>Submenu Backlight.<br><br>Select the the desired backlight control using the 2 or 0<br>Possible selections:<br>• Dimm bus: Brightness control via aircraft dimm bus</td></tr>
</table>

| | | | |
|---|---|---|---|
| | |  <br>  <br>  | • Amb-light: Brightness control via internal sensor<br>• Manual: Manual brightness control<br><br>**NOTE**<br>Calibrations for dimm bus and amb light settings is possible via system setup (password protected).<br><br>Please Consult your avionics workshop for assistance. |
| | |  | Submenu **VFR Squawk**<br>• Sets up the VFR squawk, that can be invoked pressing **VFR**. |

<table>
<tr>
<td></td>
<td></td>
<td> 
</td>
<td colspan="2">Submenu Installation (READ ONLY)<br>• Acft Data: Shows aircaft specific data<br>• ADSB: Shows ADS-B specific data<br><br><u>NOTE:</u><br>Settings are password protected (=read only) in normal operation mode.<br>Please consult the VT-2000 installation manual or your avionic workshop for modifications.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td> 
</td>
<td>Adress: 24-Bit Mode-S Adresse<br>Flight-ID: Aircraft registration or company Callsign<br>AltSrc: Altitude source<br>OTG: Configuration of OTG (on the ground) switch<br>Maxspeed: Aircraft max. cruising TAS<br><br>Please consult the installation manual for detailed information.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td> 
</td>
<td>Category: Aircraft category<br>A1090-In: ADS-B 1090 in capability installed in the aircraft<br>L/W Code: informatio about aircraft dimension<br><br>Please consult the installation manual for detailed information.</td>
</tr>
</table>

| | | | |
|---|---|---|---|
| | | | Submenu **Info**:<br><br>Shows version information about control unit, central unit and FPGA. |
|  | For extended setup or maintenance, a password is required. Consult the VT-2000 installation manual for password and instructions for extended setup or consult your avionics workshop.<br><br>The key is reqired for generating passwords for maintenance. | | |

## 2.7. Setting Up Flight Specific Data

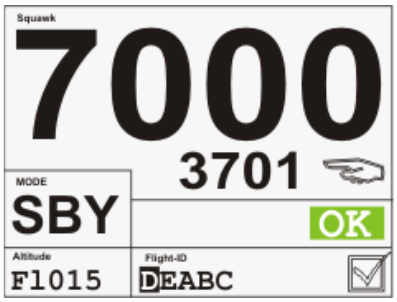
### 2.7.1. Flight id / aircraft registration / company callsign

A Mode-S transponder broadcasts the flight id (FID, company callsign for commercial aircraft or the aircraft registration for smaller private operated aircraft).

**The flight id may be changed if required. Usually the FID is the callsign of your aircraft unless field 7 of the flight plan contains other data. Always check before each flight if your flight id has been set correctly.**

**NOTE: Flight ID must be entered left aligned without using dashes (-) or blanks.**

Follow these steps to set the flight id / aircraft registration:




Flight-ID in edit mode

- Set the unit to standby (SBY) mode
- Press the lower softkey ☜
- The ☜ symbol changes near the Flight-ID changes to ☑.
- Use 4 or 6 to navigate to the desired position and change the values using 2 or 0.
- Quit the edit mode by pressing the lower softkey again. The Symbol ☑ changes to ☜.

Please consult the VT-2000 installation manual for instructions how to set up aircraft specific parameters (Mode-S Address etc.).

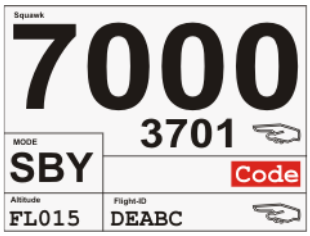
# 3. Warnings / Error messages

System failures will be detected by the internal self test function that is performed continuously.
Failures are detected malfunctions, which can not be eliminated by the user. Warnings are conditions, which may be followed by a failure. Warnings can be eliminated by the user under several conditions.

Failures and warnings will be indicated by a visual and audible signal.

If restarting the unit continues generating the same error, please contact your avionics workshop or your dealer.

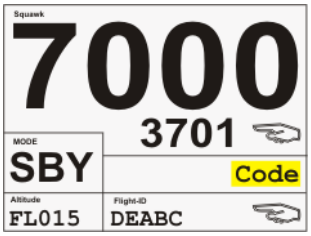
## 3.1. Failure Messages

| | |
|---|---|
|  <br>**Code** indicates a failure code. | In case of detecting a severe failure, the system will be switched into Standby (SBY) mode. All system operating will be terminated to prevent damages to system components and an audible alarm appears. Quit the audible alarms by pressing **CLR**<br><br>The system monitor indicates a failure code red underlayed.<br><br>In case of failure, try to restart the system by pressing **ON** or **ALT** . If the failure is still present, the system returns into failure mode. |

**If a system failure has been detected by the system, always contact and inform ATC, if you are flying in a transponder mandatory zone or other airspace, where a transponder is required. Never try to find the reason for a system failure or warning during the flight!!!**

## 3.2. Warnings

The system warns the pilot if malfunctions have been detected that could lead to a severe failure. It is up to the pilot to eliminate these conditions.
Warnings are indicated in case of undervoltage or operating the system out of the certified altitude range.

| | |
|---|---|
|  <br>**Code** indicates a failure code. | In case of warning, the system shows a yellow underlayed warning on the LCD screen. Additonally, a frequently repeated audible signal occurs. Both can be terminated by pressing **CLR**.<br><br>The system continues operation, but it may be limited.<br><br>If an error of the alticoder unit is detected or the system is operated out of the certified altitide range, the replied alticode will be set to zero (same as mode **ON**) |

**If a system failure has been detected by the system, always contact and inform ATC, if you are flying in a transponder mandatory zone or other airspace, where a transponder is required. Never try to find the reason for a system failure or warning during the flight!!!**

## 3.3. Error Codes

The following table shows the meaning of displayed failure and warning codes. Failures marked with an * may be caused in the system installation. Other failure or warning codes are caused by internal malfunctions. In this case the system needs to be repaired by an authorised repair shop.

| Code | | Description | Possible reason |
|---|---|---|---|
| | | | |
| SQUIT | | Squitter Error | Malfunction in transmitter module |
| ANT | * | Antenna failure | Bad antenna or antenna cable |
| PRSS | | Pressure sensor failure | Internal malfunction of pressure sensor |
| COMM | * | CAN bus communication error | Short in CAN-bus or internal malfunction |
| TXPL | | Transmitter PLL failure | Internal malfunction PLL unit |
| FPGA | | FPGA checksum failure | Internal malfunction FPGA |
| V36 | | 36 V power supply failure | Internal malfunction power supply 36V |